

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DOCTOR OF PHILOSOPHY IN  
AGRICULTURAL ECONOMICS

AGEC 923: ADVANCED RESOURCE ECONOMICS AND MANAGEMENT

STREAMS: PhD (AGEC)

TIME 3 HOURS

DAY/DATE: WEDNESDAY 14/08/2019

2.30 P.M - 5.30 P.M.

INSTRUCTIONS:

- Answer ALL the Questions in Section ONE and TWO from Section TWO.

SECTION ONE.

Answer ALL questions in this section

QUESTION ONE.

- a) Optimal control can be used as a tool for enhancing the value of ecosystem services and environmental resources. Explain the use of the current value Hamiltonian as a dynamic profit function with total user costs. (5 marks)
- b) Use the Neher Version of a dynamic fishery model to discuss possible trajectories in stock-effort space that can lead to accidental extinction. (4 marks)
- c Explain how economic principles can be used to estimate the optimal tradeoff between: use of wildlife for viewing as a tourist attraction, for sport hunting by trophy hunters, or for food/subsistence in a Kenyan county with a large wildlife resource base. (6 marks)
- d) Using examples illustrate the concept of ecosystem services and sink capacity of the biosphere. (5 marks)
- e) Evaluate the concept of Hotelling rent as a resource becomes increasingly scarce relative to current and future demand. (3 marks)
- f) Discuss the usefulness of the Euler Equation. Include its interpretation, identifying necessary and sufficient conditions, second order conditions, and transversality conditions. Explain why there are different boundary conditions for dynamic problems. (7 marks)

**QUESTION TWO**

- a) The Endangered Species Act calls for the protection and recovery of listed species independent of cost. Show that benefit/cost testing of species protection is necessary for the act to be economically rational? (9 marks)
- b) Is this an argument based on utilitarian or deontological ethics? (2 marks)
- c) Discuss the logic of these two opposing moral philosophies and their relevance to conservation. (4 marks)

**QUESTION THREE**

Using concepts developed in this course evaluate the following two opposing scenarios and the basic assumptions behind them.

- a) Alarmist doomsday Scenario. The future prospects for life on this earth are bleak. We will soon be experiencing growing resource scarcity as nonrenewable resources run out, renewable resources are depleted, and the integrity of the earth's ecosystem services is fatally compromised by our insatiable and reckless continued abuse of resources (6 marks)
- b) Optimist view. There is no need to worry about the future. As long as competitive free market conditions are maintained, market price signals and technology will seamlessly guide society to the more efficient use of existing resources and to the development of alternatives for those that are depleted. (6 marks)
- c) If the history of natural resource use in the last 200 years is anything to go by, which of these scenarios is likely to represent future reality and Why? (3 marks)

**QUESTION FOUR**

- a) Using graphical illustrations, demonstrate how subsidies and pigouvian taxes change the incentives of producers and consumers and resolve the problems of positive and negative externalities. (10 marks)
- b) Make sure to explain how the consumer and producer surpluses are affected. (2 marks)
- c) Give two reasons why in the real world it is difficult to craft efficient Pigouvian taxes and subsidies. (3 marks)

**QUESTION FIVE**

- a) Explain how the concept of constrained optimization can be used in the management of a groundwater aquifer with stochastic recharge like the one in Karen Area of Nairobi where hundreds of boreholes are being sunk into an aquifer charged by rainfall that varies in quantity and frequency from year to year. (9 marks)

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b) Empirical studies show that the optimal timing of harvesting trees in a forest is affected by long term interest rates and tree growth rates. Use basic production economics principles to explain:

i) Whether an increase in interest rates would lengthen or reduce the optimal age of harvesting. (3 marks)

ii) Whether a new technology that increased tree growth rates would lengthen or reduce the optimal age of harvesting. (3 marks)

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